

CLAIMS

What is claimed is:

1. An electric field communications system, comprising:
 - a transmitter apparatus, comprising:
 - a transmitter main electrode provided in a location so as to readily exert an electric effect on a dielectric;
 - a transmitter return electrode;
 - a signal generator that generates an electric signal; and
 - a modulator that modulates a voltage difference between said transmitter main electrode and said transmitter return electrode in response to said electric signal;
 - a receiver apparatus, comprising:
 - a receiver main electrode provided in a location where said receiver main electrode is readily subject to an electric effect from said dielectric;
 - a receiver return electrode that establishes an electrostatic coupling with said transmitter return electrode; and
 - a measuring part that measures an electric status generated between said receiver main electrode and said receiver return electrode; wherein,
 - said measuring parts comprises:
 - an electro-optical crystal that exhibits a Pockels Effect and modulates light penetrating said electro-optical crystal in response to an electric field in the space where said electro-optical crystal is located
 - light emitting means that emits light to said electro-optical crystal; and
 - light receiving means that receives light penetrating said electro-optical crystal, and output signals in response to the received light.
2. An electric field communications system according to Claim 1, wherein said receiver return electrode is connected to a plus power supply, a minus power supply, or a part having a low impedance and a stabilized electric potential.

3. An electric field communications system according to Claim 1, wherein said receiver return electrode is connected to a cabinet, said cabinet accommodating said receiver return electrode and being made of conductive materials.

4. An electric field communications system according to Claim 1, wherein said transmitter return electrode is connected to a plus power supply, a minus power supply, or a part having low impedance and stabilized electric potential.

5. An electric field communications system according to Claim 1, wherein said transmitter return electrode is connected to a cabinet, said cabinet accommodating said transmitter return electrode and being made of conductive materials.

6. An electric field communications system according to Claim 1, wherein said transmitter apparatus and said receiver apparatus are included in a single cabinet.

7. An electric field communications system according to Claim 1, wherein an electrode has functions of said transmitter main electrode and said receiver main electrode, or functions of said transmitter return electrode and said receiver return electrode.

8. An electric field communications system according to Claim 1, wherein said receiver return electrode is provided in a location where said receiver return electrode and said dielectric cannot contact one another when communication between said transmitter apparatus and said receiver apparatus is being performed.

9. An electric field communications system according to Claim 8, wherein, said receiver apparatus further comprises:

a transmitter main electrode provided in a location so as to readily exert an electric effect on said dielectric;

a transmitter return electrode; and

a modulator that changes an electric potential provided to said transmitter main electrode in response to data to be transmitted; and wherein, said receiver apparatus

provides to said dielectric an electric field in response to the electric potential generated by said modulator; and

said transmitter apparatus further comprises:

a receiver main electrode provided in a location where said receiver main electrode is readily subject to an electric effect from said dielectric;

a receiver return electrode that establishes an electrostatic coupling with said transmitter return electrode; and

a measuring part that measures an electric status generated between said receiver main electrode and said receiver return electrode; and

a demodulator that acquires an electric signal based on the measurement result by said measuring part, and acquires the transmitted data by demodulating the electric signal;

wherein said receiver return electrode is provided in a location where said receiver return electrode and said dielectric cannot contact one another when communication between said transmitter apparatus and said receiver apparatus is being performed.

10. An electric communication system according to Claim 8, wherein said measuring part measures a voltage difference between said receiver main electrode and said receiver return electrode, the voltage difference being generated by the electric field provided by said dielectric.

11. An electric communication system according to Claim 8, wherein:

in said communications apparatus, said transmitter main electrode is located near said receiver main electrode;

said receiver main electrode is provided in a location where said receiver main electrode does not contact said transmitter main electrode and said receiver main electrode; and

said measuring part measures an electric field generated between said receiver main electrode and said receiver return electrode, the electric field being measured through no dielectric and being generated by said modulator.

12. An electric communication system according to Claim 1, wherein:

said receiving apparatus further comprises a destination electrode, said destination electrode being connected to said receiver main electrode, said destination electrode having the same electric potential as said receiver main electrode;

said receiving apparatus further comprises a return electrode, said return electrode being connected to said receiver return electrode, said return electrode having the same electric potential as said receiver return electrode; and

said destination electrode and said return electrode is positioned to be opposite each other across said electro-optical crystal.

13. An electric field communications system according to Claim 1, wherein:

said transmitter apparatus changes at a regular interval a voltage difference between said transmitter main electrode and said transmitter return electrode for notifying existence of said transmitter apparatus itself;

said receiver apparatus acquires said electric signal based on the measurement result by said measuring part;

said receiver apparatus comprises a demodulator that acquires data transmitted from said transmitter apparatus, the data being acquired by demodulating the electric signal; and

said receiver apparatus comprises notification means that notifies a user of said receiver apparatus that said receiver apparatus is ready for communicating with said transmitter apparatus during when said demodulator receives the notification more than a predetermined time duration.

14. An electric field communications apparatus, comprising:

a receiver main electrode provided in a location where said receiver main electrode is readily subject to receive an electric effect from said dielectric;

a receiver return electrode that establishes an electrostatic coupling with said transmitter return electrode; and

a measuring part that measures an electric status generated between said receiver main electrode and said receiver return electrode;

wherein said measuring part comprises:

an electro-optical crystal that exhibits a Pockels Effect and modulates light penetrating said electro-optical crystal in response to an electric field in the space where said electro-optical crystal is located;

light emitting means that emits light to said electro-optical crystal; and

light receiving means that receives light penetrating said electro-optical crystal, and output signals in response to the received light.

15. An electric field communications apparatus according to Claim 14, wherein said receiver return electrode is positioned far from said dielectric and faces to said dielectric.

16. An electric field communications apparatus according to Claim 14, wherein said receiver main electrode and said receiver return electrode are positioned to locate said electro-optical crystal in an electric field generated between said receiver main electrode and said receiver return electrode.

17. An electric field communications apparatus according to Claim 14, wherein said receiver main electrode and said receiver return electrode are positioned to be in opposing relation to one another across at least a part of said electro-optical crystal.

18. An electric field communications apparatus according to Claim 14, wherein:
said measuring part is connected to said receiver return electrode;
said measuring part is positioned nearer said electro-optical crystal than said receiver return electrode; and
said measuring part comprises a return electrode having the same electric potential as said receiver return electrode.

19. An electric field communications apparatus according to Claim 14, wherein:
said measuring part is connected to said receiver main electrode;
said measuring part is positioned nearer said electro-optical crystal than said receiver main electrode; and

said measuring part comprises a destination electrode having the same electric potential as said receiver main electrode.

20. An electric field communications apparatus according to Claim 14, wherein:
said electric field communications apparatus further comprises an insulator having an upper face, a lower face, and side faces;

said measuring part is provided in said insulator;
said receiver return electrode is provided in a location where said receiver return electrode cannot contact said dielectric during electric field communications; and
said receiver main electrode is provided on said upper face of said insulator.

21. An electric field communications apparatus according to Claim 14, having a transmitter main electrode provided in a location so as to readily exert an electric effect on a dielectric, a transmitter return electrode, a modulator that changes a voltage difference between said transmitter main electrode and said transmitter return electrode in response to data to be transmitted, said modulator changes the voltage difference in response to an electric signal corresponding to notification information to notify existence of said electric field communications apparatus, wherein said electric field communications apparatus further comprises:

a demodulator that acquires the electric signal based on the measurement result by said measuring part, and acquires data transmitted from said transmitter apparatus by demodulating the electric signal; and

notification means that notifies a user of said receiver apparatus that said receiver apparatus is ready for communicating with said transmitter apparatus during said demodulator receives the notification more than a predetermined time duration.

22. An electric field communications apparatus according to Claim 14, wherein:

said transmitter apparatus further comprises an oscillator that supplies an AC voltage between said transmitter main electrode and said transmitter return electrode for charging said electric field communications apparatus;

said notification information includes information showing that said transmitter apparatus is capable of charging said electric field communications apparatus;

said electric communications apparatus comprises a rectifier that converts the AC voltage into a DC voltage, the AC voltage being induced between said receiver main electrode and said receiver return electrode;

said electric communications apparatus comprises a battery that is charged with the DC voltage obtained by said rectifier; and

said notification means notifies a user of said electric field communications apparatus that said transmitter apparatus is ready for charging said electric field communications apparatus during when said demodulator receives the notification more than a predetermined time duration.

23. An electric field communications apparatus according to Claim 21, wherein:
said receiver main electrode is positioned near said transmitter main electrode;
and

said electric field communications apparatus receives an electric effect not through said dielectric but directly.

24. An electric field communications apparatus according to Claim 14, further comprising a demodulator that acquires electric signal based on the measurement result by said measuring part, and acquires the transmitted data by demodulating the electric signal,

wherein said demodulator, in a beginning of the demodulating process, detects a polarity of a header of a received packet,

when said demodulator detects that the polarity of the header is inverted from a predetermined polarity, said demodulator inverts the polarity of the packet and demodulates the packet having the inverted polarity.

25. An electric field communications apparatus according to Claim 14, further comprising a demodulator that acquires electric signal based on the measurement result

by said measuring part, and acquires the transmitted data by demodulating the electric signal,

wherein said demodulator comprises a temporary memory for storing a received packet,

when said demodulator fails to demodulating the packet, said demodulator inverts the signal stored in said temporary memory and demodulates the packet having inverted polarity.

26. An electric field communications apparatus according to Claim 14, comprising:
a first demodulator that receives an electric signal based on the measurement result by said measuring part;

a second demodulator that receives an electric signal whose polarity is inverted from the electric signal based on the measurement result by said measuring part; and

a circuit receives output signals from said first demodulator and said second demodulator, and outputs correctly demodulated signal.

27. An electric field communications apparatus according to Claim 14, wherein said receiver main electrode has a hole.

28. An electric field communications apparatus according to Claim 14, wherein said receiver main electrode is connected to a receiver return electrode of another electric field communications apparatus.